NATIONAL FERTILIZERS LIMITED
Panipat Unit (Haryana)

Unit Profile

NFL Panipat Project was executed with the help of M/s. Toyo Engg. Corporation, Japan and Indian consultant M/s. Engineers India Ltd. The cost of project was Rs. 2210 million with Rs. 550 million as foreign components. The Unit has a total area of 574 acres. Factory area is 442 acres and a beautiful township spread over an area of 132 acres. The Urea plant was designed to produce 1550 TPD urea. Ammonia plant was designed to produce 900 MT/day Ammonia based on partial oxidation of Residual fuel oil/LSHS by SHELL GASIFICATION process. Commercial production of Urea was achieved in Sept.’1979. A Captive Power Plant was also installed with 30 MW capacity at a cost of Rs.1100 million in the year 1988.

In the year 2001-02, Unit introduced the concept of Neem coating on urea. After rigorous R&D the product was stabilized and test marketed. Seeing the overwhelming response from the farmers unit started large scale production. From June’15 as per Goverment policy Neem coated Urea production is 100% (unit has produced 1893307 MT of Neem coated Urea).

In the year 2012-13, Unit undergone for Ammonia feedstock change over project as an energy conservation measure. Technology changeover has been done from partial oxidation of oil to steam methane reforming of NG/RLNG. Commercial production achieved on 28.03.2014.

- Presently Basic process route of plant is as under:
Specific Energy Consumption / MT of Urea:

Due to consistent efforts put for sustained running of plant & also various energy saving measures taken in Ammonia plant & in Steam generation plant reduction in specific energy consumption/MT of Urea has been improved from 7.550 GCal/MT Urea to 7.302 GCal/MT Urea.

Energy Conservation Projects Implemented

- In order to reduce the energy consumption this year, Unit has undergone for various energy saving schemes and improvement in boilers in order to improve upon performance of boilers thereby reducing unproductive losses. Details are as under:
- Brief description of Various energy saving measures taken in Ammonia plant & in Steam generation plant are as under:

Synthesis gas compressor turbine Nozzle block replacement:

The synthesis gas compressor is a steam turbine driven centrifugal compressor which is used to compress synthesis gas to ~190 kg/cm²g. Steam consumption in Synthesis compressor Turbine (GB601) was running on higher side wrt new process conditions after Ammonia feedstock changeover project. M/s Siemens provided new modified nozzle block thereby optimizing the consumption of steam. Nozzle block was replaced in ATA-15.

Steam super-heater damper plate modification:

Earlier, super-heater damper was offering resistance to the gas flow resulting in reduced pressure in downstream due to which steam consumption in synthesis gas booster compressor was running on higher side. Damper was got re-designed & damper plate was modified which resulted in saving of 1 MT/hr of steam.
York refrigeration compressor (motor driven) hook up with GC-601 (steam driven refrigeration compressor) in Ammonia plant: New Ammonia refrigeration compressor (York compressor, X501) and Old refrigeration compressor (GC601) were running independently for meeting the refrigeration requirement of the plant. A scheme was prepared for interconnection of these two to save power by stopping HT motor of 1400 KW. Presently, complete refrigeration requirement is being met through GC-601 only and has resulted in saving of 0.8 MWH of electrical power.

Replacement of fluorescent lights with LED lights in office buildings:

Existing High pressure sodium vapour lamps (HPSVL) installed at various locations in township as well as factory (varying from 60W to 160 W). In order to conserve power, 150 normal fluorescent lights of HPSVL (High pressure sodium vapour lamps) were replaced with LEDs resulting in electrical power saving.
Use of Combustion catalyst:

Combustibles coming along with ash from boilers remained on higher side which was direct loss of coal. To improve upon that market was explored and use of Combustion catalyst (Thermact) was started. This combustion catalyst being added along with the pulverized coal improved coal combustion and thus reduced un-burnt combustibles in fly ash. Addition of coal catalyst has resulted in reduction of coal consumption by about 2.7%.

Improvement in boilers:

Boilers are used for generation of steam which is used for process as well as power generation. Performance of these boilers was not good. Problems being faced in these boilers were, like high rejects, high Flue gas temperature, and tube failures. Extensive jobs taken up and after certain replacements/modifications performance of boilers improved considerably thereby saving in coal and NG consumption. Various activities taken up are as under:

1. Repair/replacement of flue gas ducts
2. Extensive job taken up on mills and dampers
3. Better operational practices like:
   - Improving furnace draught
   - Minimizing mill change-over
Indo Gulf Fertilisers (A Unit of Aditya Birla Nuvo Limited) manufactures UREA & enjoys leadership position in Indo-Gangetic plains due to its strong brand *Birla Shaktiman* - a most preferred choice of the farmers. IGF’s Ammonia/ Urea manufacturing facility is located at Jagdishpur Industrial Area (UP). The main Raw material is natural gas. The company was formed in 1983 and Indo Gulf Fertilizers (IGF) merged in Aditya Birla Nuvo Ltd. in Sept. 2005. IGF is the only fertilizer company in India who won TPM Excellence from JIPM, Deming Application Prize etc. & 1st Fertilizer plant in India to register CDM (Clean Development Mechanism) project with UNFCCC.
Indo Gulf’s state-of-the-art manufacturing facility at Jagdishpur in Uttar Pradesh is considered one of the most energy efficient plants in the country. The fertilizer complex started production in 1988 comprises of an Ammonia plant having an installed capacity of 1350 MTPD based on Haldor Topsoe A/S and two streams of Urea each having an installed capacity of 1100 TPD based on Snamprogetti SPA technology incorporating several low energy features. The related facilities of off-sites and utilities consist of a captive power and steam generation plant with two Gas turbines, two heat recovery units and two service boiler, cooling towers, ammonia storage, naphtha storage, inert gas plant, effluent treatment plant etc. Indo Gulf’s marketing activities span Uttar Pradesh, Bihar, Jharkhand and West Bengal.

The plant was reassessed to 1520 MTPD from earlier capacity of 1350 MTPD for Ammonia and 1310 MTPD from earlier capacity of 1100 MTPD for each stream of Urea w.e.f. 01.04.2000.

The control system at the complex is most advanced and is of Honeywell Experian. An ERP system developed in house used to monitor and integrate all key business operations across the organization for effective optimization and control.


Energy Saving Schemes Implemented in FY 2015-16:

a) **Dry Ice cleaning of convection coils in Primary Reformer furnace, steam superheat coils and Boiler tubes:**

Dry Ice cleaning was a new technique which was adopted by IGF in ATR for cleaning of convection coils in Primary Reformer furnace, steam superheat coils and Boiler tubes. Conventional ways is to clean the coils with air. However, this method was not very effective.

The dry ice blasting penetrates deep into the fins / gaps between the coil and removes the dust deposits. As CO2 changes from solid to gas state, its volume expands 800 times, creating “micro explosions”. This causes rapid micro-cracking between coating layers, bonds fail & coating breaks away from coil surface. Primary Reformer stack temperature reduced from about 180 deg.C to about 155 deg.C.

b) **Improve operational efficiency by eliminating losses of Hot Gas-Gas Exchanger in Ammonia Plant:**

Suspected bypassing in floating head’s gland packing joint because of eccentricity in gap between gland sealing joint of floating head and shell of exchanger which
was affecting the conversion in Ammonia converter and consequential high energy consumption i.e. energy loss due to increase of synthesis section operating pressure by about 4 kg/cm².

IGF team innovatively thought and decided to go for in-house implementation by “Online sealing method” to fill eccentric gap by “Online Special Sealing Compound” competent to process. IGF team resolved chronic problem of bypassing of product gas by in-house implementation. Synthesis Loop pressure reduced by about 4 Kg/cm² resulting in energy saving.
c) Details of Electrical Energy saving schemes implemented in FY 2015-16:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Schemes</th>
<th>Annual Electricity Saving (KWH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optimization of Generation Voltage</td>
<td>732000</td>
</tr>
<tr>
<td>2</td>
<td>Replacement of HPMV lamp with LED lamp</td>
<td>69000</td>
</tr>
<tr>
<td>3</td>
<td>Replacement of 5280 nos. Tube lights, 1145 nos. ceiling lights, 130 nos. incandescent lamp and 24 nos. fountain light with LED light in various areas of Plant &amp; Township</td>
<td>839000</td>
</tr>
</tbody>
</table>

**Specific Energy Consumption:**

Following graphs represent SEC of Ammonia and Urea plants in Million Kcal/MT for last four financial years.

![Ammonia Plant’s Energy Performance](image1)

![Urea Plant’s Energy Performance](image2)
**Unit Profile**

Rashtriya Chemicals and Fertilizers Limited (RCF) was incorporated on March 6, 1978 on the reorganization of the erstwhile Fertilizer Corporation of India Limited as a result of reorganizing Public Sector Fertilizer Industries into Five Companies. RCF is a leading fertilizer and chemical manufacturing company. RCF has two operating units, one at Trombay in Mumbai and the other at Thal, Raigad district, about 100 KM from Mumbai. RCF manufactures Urea and Complex fertilizers (NPK) along with a wide range of Industrial Chemicals. Govt. of India has accorded “Mini Ratna” Status to RCF.

The Ujjwala Urea and Complex fertilizer Suphala brands of fertilizers manufactured by RCF carry high brand equity and are recognized brands all over the country. RCF has countrywide marketing network in all major states. Besides Urea and Complex fertilizers, RCF also produces bio-fertilizers, micronutrients and 100% water soluble fertilizers. Apart from these products, RCF produces almost 20 industrial chemicals which are important for the manufacture of dyes, solvents, leather, pharmaceuticals and a host of other industries.
**Achievements During the Year 2015-16:**

- Highest ever total fertilizer production 10.93 Lakh MT including specialty Fertilizer production. Previous Best was 10.88 Lakh MT in 2014 – 2015
- Lowest ever specific energy consumption of Ammonia I (9.170 Mkcal/MT), Ammonia V (8.815 Mkcal/MT) and Urea (6.779 Mkcal /MT) has been achieved.
- We have achieved highest ever Ammonia Production of 5.14 lakh MT, from both Ammonia I & Ammonia V Plant.
- Highest ever stream days have been achieved for Ammonia V, Urea & Suphala plants
**Use of Non-Conventional Source of Energy/Application:**

- Out of the various options of generation of renewable source of energy, solar energy applications are making rapid stride in the country. The technology is also developing very fast and the capital cost involved is also going down. Moreover, as compared to wind and hydel sources the solar source is more evenly distributed in the country thereby reducing the dependency on specialized sites for generation of energy.

- As a progressive company, RCF has already forayed in to solar power generation. The unit has installed 2 nos. of roof top solar power generation facilities of 10 kWP capacity at top offices.

- A 2 MWp Grid connected Photovoltaic Solar power plant was to be installed in 2014-15 within factory premises of Trombay unit with capital Cost of Rs.14.60 Crore. The scheme was completed 27th January 2016 and plant is generating solar power to the tune of 9 to 10 MW per day. The power generated is used for captive consumption of the Trombay unit and reduce power import to that extent.
Energy Policy:

Rashtriya Chemicals and Fertilizers Limited (RCF Ltd.), is committed to achieve continual excellence in energy performance and comply with all the applicable legal and other requirements related to energy usage and energy efficiency.

RCF Ltd. shall strive to achieve the goal through:

- Adopting of technologies to enhance energy efficiency.
- Monitoring, controlling and reviewing the consumption of various forms of energy through effective Energy Management System.
- Putting efforts for adoption of operational control strategies for improving specific energy consumption in the production processes.
- Enhancing awareness of employees through training for conservation of natural resources and energy.
- Initiating steps for achieving improvement in Energy Performance through active participation of employees.

Date: 14th February, 2013

R. G. Rajan
Chairman & Managing Director
Unit Profile

Indian Farmers Fertiliser Cooperative Limited (IFFCO), globally acclaimed cooperative in fertilizer production and marketing has been striving for socio-economic upliftment of the rural population of India since inception. Initially, IFFCO set up its Plants at Kalol and Kandla in Gujarat which were commissioned in 1975. Subsequently, it commissioned plants at Phulpur and Aonla in UP in the year 1981 and 1988, respectively. In order to augment its complex fertilizer manufacturing capacity, IFFCO acquired DAP/NPK/NP plant at Paradeep in September, 2005. IFFCO has become a diversified entity spreading its wings across the different continents. Indian Potash Ltd (IPL) in India, Industries Chimiques du Senegal (ICS) in Senegal, Oman India Fertiliser Company (OMIFCO) in Oman and Jordan India Fertiliser Company (JOIFCO) in Jordan.
Company (JIFCO) are important fertiliser joint ventures. As part of strategic diversification, IFFCO has entered into several key sectors. IFFCO-Tokio General Insurance Ltd (ITGI) is a foray into general insurance sector.

IFFCO-Phulpur Unit is located at Phulpur, Allahabad in the state of Uttar Pradesh. It has two Units Phulpur-I & Phulpur-II. Both of its units have been performing well since commissioning. Phulpur Unit –I started its commercial production in March,1981 with a capacity of 977 MTPD Ammonia Plant designed and engineered by M/s. MW Kellogg, U.S.A. based on Steam Naphtha Reforming Process and 1670 MTPD Urea Plant based on M/s. Snamprogetti Technology, Italy. Three coal fired high pressure boilers having capacities of 125 MT/hr each and 12.5 MW Turbo-Generator supplied by BHEL, India along with associated offsite facilities like DM water plant, Inert gas plant etc. were commissioned in March,1981. Initially, Ammonia-I plant was based on Naphtha feed stock. In the year 2006, RLNG conversion project was taken up and feed stock of ammonia plant was changed to RLNG. Further, capacity revamping was completed with de-bottlenecking of the plant under the Capacity Enhancement Project (CEP) in the year 2008. At present unit is running at 100% of their revamped capacity of 1215 MTPD of ammonia and 2115 MTPD of urea in Phulpur-I.

**Energy Consumption**

Ammonia and Urea manufacturing is highly energy intensive and it contributes more than 80% of the total cost of production Urea. Therefore, a slight change in energy consumption affects the cost of production in a big way. Apart from cost of production, reduction in energy saves the valuable fast depleting natural resources such as Natural Gas and Coal.

IFFCO Phulpur Unit was accredited with BSEN-16001:2009. From, year 2012 the Unit was certified with Energy Management Certification ISO -50001 for Energy Management System making IFFCO Phulpur the first in the Fertiliser Sector to receive this accreditation.

**Energy Conservation Measures Implemented in 2015-2016:**

1. **Revamping of all 336 Nos of Primary Reformer Tubes:** The primary reformer in Ammonia Plant is most energy intensive furnace. The hydrocarbon steam reforming is done in catalyst filled tubes in reformer. Steam reforming is an endothermic reaction. Hence heat is supplied by burning R-LNG fuel in reformer burners. This heat is absorbed by reformer tubes for endothermic reaction. All 336 Nos. tubes of Primary reformer have been replaced with new one. The earlier Tube material was G4852 MICRO which was replaced with better heat transfer tube material MANAURITE XM. The better tube
metallurgy has increased the efficiency of radiant section by 2.33% and thus reduced the R-LNG fuel in Primary reformer.

Yearly Saving (MTOE) : 2037  
Yearly Saving (Rs. Lakhs) : 621  
Investment (Rs. Lakhs) : 3700

2. Use of THERMACT as a multifunctional combustion additive in Coal Fired Boiler No. 2 & 3:

THERMACT is a multifunctional combustion catalyst, specially developed & formulated to improve the combustion of Coal which is used as a primary fuel in all types of coal fired boilers. It also reduces the problems related to combustion and its associated cost of energy generation. After adding coal additive Boiler efficiency increased by approximately 2.5 % & reduced coal consumption by approximately 16 MTPD each in Coal fired boilers.

Yearly Saving (MTOE) : 1217  
Yearly Saving (Rs. Lakhs) : 63.3  
Investment (Rs. Lakhs) : 15.5
3. **Installation of 585 KW Solar Power Plant at the roof of Raw water storage tank:**

585 kW Solar power plant has been installed at the roof top of Raw water storage tank. The generated power is connected to existing feeders of offsite area.

Yearly Electrical Saving (kWh) : 39052  
Yearly Saving (Rs. Lakhs) :  2.34  
Investment (Rs. Lakhs) :  122.50

![View of 585 KW Solar Power Plant](image1)

4. **Installation of 50 Nos. of Occupancy sensor in Office Room:**

50 Nos Occupancy sensors have been installed in offices. It is a lighting control device that detects occupancy of a space by people and turns the lights, fans & Air Conditioner on or off automatically.

Yearly Electrical Saving (kWh) : 33815  
Yearly Saving (Rs. Lakhs) :  2.01  
Investment (Rs. Lakhs) :  1.52

![Installed Occupancy Sensors in offices](image2)
5. **Replacement of 20 Nos. of 400 Watt HPMV Flood Light by 200 Watt Induction Flood Light in Workshop & TG-I Area:**

To reduce the energy consumption in illumination, 20 Nos of 400 watt Flood Light replaced by 200 Watt Induction Flood Light in Workshop & TG-I Area.

- Yearly Electrical Saving (kWh) : 4933
- Yearly Saving (Rs. Lakhs) : 0.30
- Investment (Rs. Lakhs) : 1.05

![Installed Induction Flood Light](image1)

6. **Replacement of 250 Watt HPMV Flood Light by 150 Watt Induction Flood light at Matri Park in Township:**

To reduce the energy consumption in illumination, 10 Nos of 250 watt HPMV Flood Light replaced by 150 Watt Induction Flood Light at Matri Park in Ghiyanagar.

- Yearly Electrical Saving (kWh) : 1200
- Yearly Saving (Rs. Lakhs) : 0.07
- Investment (Rs. Lakhs) : 0.55

![Installed Induction Flood Light](image2)
7. **Replacement of Fluorescent Tube Light with Copper Ballast (53 Watt) & Electronic Ballast (39 Watt) by LED Tube Light (20 Watt):**

To reduce the energy consumption in illumination, Fluorescent Tube Light with 40 nos of Copper Ballast (53 Watt) & 60 nos of Electronic Ballast (39 Watt) replaced by 100 nos of LED Tube Light (20 Watt) at Ghiyanagar Township.

Yearly Electrical Saving (kWh) : 4429  
Yearly Saving (Rs. Lakhs) : 0.25  
Investment (Rs. Lakhs) : 0.41

Before : Fluorescent Tube Light  
After : LED Tubelights
Unit Profile

Udyogamandal Complex, have two FACTAMFOS Plants with total installed capacity of 1,48,500 MTPA, Ammonium Sulphate Plant with installed capacity of 2,25,000 MTPA and Caprolactam Plant with installed capacity of 50,000 MTPA. Intermediate Production Plants include 1150 TPD Sulphuric Acid Plant and 990 TPD Ammonia Plant. The Ammonia Plant is operated with feed and feedstock of RLNG since October 2013.
Major Energy Saving Projects

Reduction of Drive Capacity of Main Air Blower in Acid Plant

In FACT, Udyogamandal Complex, there are two Sulphuric Acid Plants of capacity 600 & 550 Tons Per Day (TPD), commissioned in 1981 and 1988 respectively.

The 550TPD acid plant namely SO$_2$ acid plant was commissioned along with the inception of the Caprolactam plant in Petro Chemical Division for supplying Sulphur Dioxide of 375 TPD as intermediate raw material for producing Caprolactam. Subsequent to the shutdown of the Petrochemical plants due to viability reasons, requirement of Sulphur Dioxide gas was stopped and SO$_2$ acid plant started running for producing only Sulphuric Acid for the fertiliser requirements.

During the running of the Petro Chemical plants, Blower, supplied by Howden, driven by 3.3 KV 625 KW motor was used for supplying Sulphur Dioxide gas to the Petro Chemical plants and blower, supplied by Andrew Yule, driven by 3.3 kV 940 KW motor, was designed for supplying process air for sulphur burning. Due to the changed scenario of stoppage of caprolactam plants and hence reduced load of acid plant, process air requirement for sulphur burning was reduced drastically. This resulted in venting of process air from the higher blower discharge, providing additional silencer in the blower discharge to reduce sound level. In the changed scenario, requirement for running the high energy consuming Andrew Yule blower was critically analysed. Process scheme was modified and implemented within house design and changed over the gas blower to process air function. Construction of new suction hood and discharge line re routing were done to facilitate implementation of the scheme (fig 2). The total expenditure for modifications was less than Rupees Two Lakhs.

Considerable quantity of savings in energy was resulted after this change over of gas blower to air blower as lower capacity 625 kW blower is in service instead of the 940 kW blower. The modification also supported in a big way for the smooth plant operation with reduced air pressure and flow. Unpleasant sound by air venting was also eliminated by the modification.
Fig : Modification in Process Flow

Annual Savings
8.637 LU (247 MTOE), Rs. 47.42 Lac with Investment of Rs. 2 Lac

Fig-3 : SEC Graph Factamphos 20:20

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<th>Production MT</th>
<th>SEC Electrical MTOE</th>
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<td>2015-2016</td>
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### Energy Conservation Activities Implemented (2015 – 2016)

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<thead>
<tr>
<th>Year</th>
<th>Project/Program/Activity Title</th>
<th>Project Cost (Rs. Lakhs)</th>
<th>Annual Savings</th>
<th>Total Cost Savings (Rs. Lakhs)</th>
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<td>Electricity (MU)</td>
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<td>2015-16</td>
<td>Change over to lower capacity drive of Main Air Blower in Acid Plant with modification in process flow scheme</td>
<td>2.00</td>
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<td>Switching OFF under utilised Transformers in Ammonium Phosphate Plants with modification in power distribution scheme</td>
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<td>Replacement of vintage motors in Ammonium Phosphate Plants with energy efficient units</td>
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<td></td>
<td>Improvement in Lighting system in Petro Plants</td>
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